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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/589,602

08/16/2006

Hiroyuki Kyushima

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EXAMINER

HOLLWEG, THOMAS A

ART UNIT

PAPER NUMBER

2879

NOTIFICATION DATE

DELIVERY MODE

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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/589,602	Applicant(s) KYUSHIMA ET AL.	
	Examiner Thomas A. Hollweg	Art Unit 2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 9-11, 13, 15, 17 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 9-11, 13, 15, 17 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>5/4/10</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Acknowledgement of Amendment

1. Applicant's Amendment of June 16, 2010, is acknowledged. Claim 8 is canceled. Claim 23 is added. Claims 1-6, 9-11, 13, 15, 17 and 23 are currently pending.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on March 5, 2010, is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Objections

3. The following claims are objected to because of the following informalities:
 - a. Claim 1, refers to "an internal space" in line 2 and "the inner space" in line 6. Claim terminology must be consistent throughout the claim.
 - b. Claim 1, refers to "an electron multiplier section" in line 8 and then to "said electron multiplier" in line 10. Claim terminology must be consistent throughout the claim.
 - c. Claim 23, the phrase "that part of the electrons multiplied in said electron multiplier section as a signal" is awkward and needs revising.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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5. **Claim 1-6, 9-11, 13, 15, 17 and 23 are rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 1 recites “wherein, when viewing said electron multiplier section and said anode along an incidence direction of the light, said electron multiplier section and said anode are arranged along a direction orthogonal to the incidence direction of the light”. This limitation is unclear for two reasons.

7. First, the “incidence direction of the light is not described in the claim and cannot be determined. The claim previously recites that “light [is] captured through said enclosure”, but does limit the incoming light to a specific direction. It would be understood by one skilled in the art that any portion of the enclosure may be transparent and therefore light may come from any direction as long as it is incident on the photocathode. Therefore the incidence direction of the light cannot be determined.

8. Second, even if the incidence direction of the light can be determined, the above recited claim limitation would seem to indicate that the electron multiplier section and the anode are only arranged along a direction orthogonal with the incidence direction of the light “when viewing said electron multiplier section and said anode along an incidence direction of the light”, and not when viewed from other directions. It is unclear how this condition can be met. If the incident direction of the light were set to one direction and the electron multiplier section and the anode were arranged orthogonal to that direction, this orthogonal relation would remain regardless of angle from which

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the device is viewed. For these reasons, the metes and bound of the claims cannot be determined.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. **Claims 1-3, 5, 6, 11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodberlet et al., U.S. Patent No. 7,049,747 B1, in view of Burlefinger et al., U.S. Patent No. 6,492,657 B1.**

11. **With regard to claim 1**, in figures 4a-c, Goodberlet discloses a photomultiplier comprising: an enclosure having an inner wall defining an internal space that is kept in a vacuum state, said inner wall including a flat part (best shown in fig. 4c on which the photocathode 430 microchannels 420 and anode 450 are arranged) ; a photocathode (430), accommodated in said enclosure, emitting photoelectrons to the inner space of said enclosure in response to light captured through said enclosure; an electron multiplier section (420/480), arranged on and in direct contact with the flat part of said inner wall, for multiplying in a cascading manner the photoelectrons emitted from said photocathode (430), said electron multiplier section having a structure making electrons multiplied in the cascade manner propagate along the flat part of said inner wall; and an anode (450), arranged on and direct contact with the flat part on which said electron multiplier section (420/480) is arranged, for taking out electrons having arrived thereat

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among the electrons multiplied in said electron multiplier section (420/480) as a signal; and wherein, when viewing said electron multiplier section (420/480) and said anode (430) along an incidence direction of the light, said electron multiplier section (420/480) and said anode (430) are arranged along a direction orthogonal to the incidence direction of the light while being apart from each other (assuming the incidence direction of the light is from above relative to the view shown in figure 4c) (col. 3, lines 11-58).

12. Goodberlet does not expressly disclose that said anode is comprised of a silicon material.

13. Burlefinger, in figure 4a, teaches a photomultiplier having an anode (22) where the anode is comprised of a silicon material (Abstract; col. 2, line 42 – col. 3, line 43).

14. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Goodberlet photomultiplier where said anode is comprised of a silicon material, as taught by Burlefinger, because silicon material can form an excellent electron detector and it can be formed by a simple manufacturing process.

15. **With regard to claim 2**, in figures 4a-c, Goodberlet discloses that said enclosure comprises a lower frame comprised of a glass material (460) (col. 4, lines 24-25); an upper frame (410) opposing said lower frame (460); and a side wall frame (surrounding microchannels 420, integrated with lower frame 460), provided between said upper frame (410) and said lower frame (460), having a form surrounding said electron multiplier section (420/480) and said anode (450) (col. 3, lines 11-58).

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16. **With regard to claim 3**, in figures 4a-c, Goodberlet discloses that said electron multiplier section (420/480) and said anode (450) are arranged on the flat part of said inner wall of said enclosure while in a state separated by a predetermined distance from said side wall frame constituting a part of said enclosure (col. 3, lines 11-58).

17. **With regard to claim 5**, in figures 4a-c, Goodberlet discloses that said upper frame (410) is comprised of a glass material (col. 5, lines 31-35).

18. **With regard to claim 6**, in figures 4a-c, Goodberlet discloses that said electron multiplier section (480) is comprised of a silicon material (col. 4, line 63).

19. **With regard to claim 11**, in figures 4a-c, Goodberlet discloses that said upper frame (410) has a transmitting window for taking light into said enclosure (col. 3, lines 32-33).

20. **With regard to claim 23**, in figures 4a-c, Goodberlet discloses that the anode (450) has an electron-incidence surface that part of the electrons multiplied in said electron multiplier section (420/480) as a signal, the electron incidence surface being substantially orthogonal to the flat part of said inner wall of the enclosure (best shown in fig. 4c) (col. 3, lines 38-45).

21. **Claims 4, 9, 10, 13, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodberlet and Burlefinger, as applied to claims 1 and 2, and further in view of Then et al., U.S. Patent No. 5,568,013.**

22. **With regard to claim 4**, Goodberlet and Burlefinger disclose all of the limitations except they do not expressly disclose that the side wall frame is comprised of a silicon material.

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23. Goodberlet teaches that the frame may be made of insulating and etchable materials (col. 4, lines 24-26). Also, in figures 13-17, Then teaches a photomultiplier where the side wall frame (40) is comprised of a silicon material (col. 3, lines 48-61).

24. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Goodberlet and Burlefinger photomultiplier where the side wall frame is comprised of a silicon material, as taught by Then, because this material is easily etchable.

25. **With regard to claim 9**, Burlefinger teaches that an anode may be comprised of a silicon material, as discussed in the rejection of claim 1 above. However, Goodberlet and Burlefinger do not expressly disclose that said electron multiplier section and said side wall frame is comprised of a silicon material.

26. Goodberlet teaches that silicon is an excellent material for the surface of the electron multiplier section (col. 4, line 62), and that the frame may be made of insulating and etchable materials (col. 4, lines 24-26). In figures 13-17, Then teaches a photomultiplier where the said electron multiplier section (16) and said sidewall frame (40) are comprised of a silicon material (col. 3, lines 48-61).

27. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Goodberlet and Burlefinger photomultiplier where the electron multiplier section and the side wall frame is comprised of a silicon material, as taught by Then, because this material is easily etchable.

28. **With regard to claim 10**, in figures 4a-c, Goodberlet discloses that said upper frame (410) is comprised of a glass material (col. 5, lines 31-35); and wherein said

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upper frame (410) is in direct contact with and joined to said side wall frame such that said upper frame (410) and said lower frame sandwich said side wall frame therebetween (col. 3, lines 11-30).

29. **With regard to claim 13**, Goodberlet and Burlefinger disclose the device of claim 2. However Goodberlet discloses a method of manufacturing the photomultiplier where the lower frame is integrated with the side wall frame and the electron multiplier section, and not where the lower frame is formed separately from the side wall frame and the electron multiplier section.

30. Then, in figures 13-17, teaches a method of manufacturing the photomultiplier comprising the steps of: preparing said lower frame (98), comprised of a glass material, constituting a part of said enclosure (80); preparing said side wall frame (40) constituting a part of said enclosure (80), said side wall frame being formed together with said electron multiplier section (16) by etching a single silicon substrate; preparing said upper frame (86) constituting a part of said enclosure (80); and fixing said side wall frame (40) to said lower frame (98) together with said electron multiplier section (16) and said anode (104) while making said side wall frame (40) be in direct contact with said lower frame (98) (col. 3, line 48 – col. 4, line 8; col. 6, line 62 - col. 7, line 36).

31. Then does not expressly disclose that the anode is formed together with the side wall frame and the electron multiplier section.

32. Goodberlet discloses an anode integrated with an on the same plane as the electron multiplier section. Burlefinger teaches an anode (22) comprised of silicon material, the same material as the Then electron multiplier section, and further teaches

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that a side wall frame (21) is formed together with an electron multiplier section (24/26) and an anode (22) by etching a single silicon substrate (col. 2, line 42 – col. 3, line 43).

33. At the time of invention, it would have been obvious for a person having ordinary skill in the art to construct the Goodberlet and Burlefinger photomultiplier with the method taught by Then and where the anode is formed together with the side wall frame and the electron multiplier section, as taught by Burlefinger, because forming these elements together greatly simplifies that construction of the device.

34. **With regard to claim 15**, in figures 13-17, Then discloses a method where said upper frame (86) is comprised of a glass material; and wherein said upper frame (86) is in direct contact with and joined to said side wall frame (40) such that said upper frame and said lower frame (86) sandwich said side wall frame (40) therebetween (col. 6, line 62 - col. 7, line 36).

35. **With regard to claim 17**, in figures 13-17, Then discloses a method where said upper frame (86) is formed with a transmitting window for taking light into said enclosure (80) (col. 7, lines 8-9).

Response to Arguments

36. Applicant's Arguments have been considered but are moot in view of the new grounds for rejection.

Conclusion

37. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

38. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

39. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas A. Hollweg whose telephone number is (571) 270-1739. The examiner can normally be reached on Monday through Friday 7:30am-5:00pm E.S.T..

40. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

41. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TH/

/NIMESHKUMAR D. PATEL/

Supervisory Patent Examiner, Art Unit 2879